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ABSTRACT

This study focuses on the need to know more about Nevada science teachers, their current teaching situations, their educational and experience backgrounds, their needs, and their opinions. Questionnaires were mailed to all 471 Nevada educational personnel assigned to teach science classes in the spring of 1990. The number of respondents was 345. Major findings of the study are: (1) 70% of Nevada's science teachers work in urban district; (2) 52% are senior high school teachers and 33% are middle or junior high school teachers; (3) the mean class size was 24.4 students (rural=20.5 and urban=26.8); (4) 55.7% rated their teacher preparation program as either good or excellent; (5) the two most needed changes expressed were: more adequate science facilities, equipment, and materials, and a reduction in class size; and (6) the most needed areas of professional development are in science teaching strategies and techniques, laboratory safety and use, knowledge in science content areas, the use of computers and technology, and techniques for motivating students. The study instrument is appended. (PR)

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ED 363 498

# Science Teachers in Nevada: State of the Profession Spring, 1990

William J. Pankratius, Ph.D.
and
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# State of the Profession
# Spring, 1990

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## Major Findings

- 70% of Nevada's science teachers work in the urban districts.
- 52% are senior high school science teachers; 33% are middle or junior high teachers.
- The mean class size for science teachers was 24.4; for rural science teachers the mean was 20.5, for urban science teachers, 26.8. The range was from 1 to 56.
- Aspects of their teaching situations rated most inadequate were: computer software, computers for students, and funds for science equipment and materials.
- 63.5% of Nevada's science teachers completed their undergraduate preparation in other states.
- 69% of Nevada's science teachers have earned one or more majors in science areas; 24.6% have a science minor only.
- 47.8% of science teachers hold Master's Degrees.
- 55.7% of science teachers rated their teacher preparation program as either good or excellent.
- 54.5% are or have been certified to teach in other states or countries.
- More science teachers are trained and licensed in biology or biological science than in any other single area of science.
- The median number of years of experience of this group of teachers is 13; 23.5% have less than five years of experience, 26.4% have over 20 years.
- Highest considerations in choosing teaching as a career were: interest in science, desire to work with youth, and opportunity to provide an important service.
- 62.6% of Nevada's science teachers are males, 90% are white.
- The two most needed changes expressed by science teachers were: more adequate science facilities, equipment, and materials and a reduction in class sizes.
- The most needed areas of professional development by Nevada's science teachers are in science teaching strategies and techniques, laboratory safety and use, knowledge in science content areas, the use of computers and technology in science, and techniques and ideas for motivating students.

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## Introduction

In recent years there has been much discussion both nationally and regionally concerning the need to improve the teaching and learning of science in our schools. American students in general fall below students of other industrialized countries in measures of science achievement (Markle, 1990). At the same time it is difficult for schools to compete with industry in recruiting teachers trained in science. Another factor is the cost of the special equipment needed to teach science subjects adequately which must compete with other educational needs at a time of restricted budgets in many school districts.

Against this background, there is a need to know more about Nevada science teachers, their current teaching situations, their educational and experience backgrounds, their needs, and their opinions. For the Department this survey represents one in a series of planned studies of different educational personnel including social studies teachers and school counselors. The profiles resulting from these studies provide a degree of knowledge about Nevada's educational personnel that has previously been unavailable. This knowledge can be used in policy making in order to improve teaching and learning in Nevada's schools. For the University of Nevada, Las Vegas, this survey was viewed as an important effort to determine pre-service and in-service educational needs as expressed by current science teachers. The results will be used to plan future science education programs in the College of Education and to meet the needs of today's Nevada science teachers.

## Methodology

A mutual interest in a survey of Nevada science teachers by the College of Education, University of Nevada, Las Vegas and the Nevada Department of Education led to a collaboration between these two entities in the development of a study design and the instrument to be used to collect the data. Drafts of the questionnaire were pre-tested with the cooperation of science teachers in two schools (a junior high and a senior high) in the Reno-Carson City area and two schools in the Las Vegas area.

Questionnaires were mailed to all (471) Nevada educational personnel assigned to teach science classes in the spring of 1990. The number who responded initially was 260. Following a second mailing of questionnaires to non-respondents, an additional 85 persons returned completed questionnaires for a total of 345. This brought the overall response rate to 73.2%. This degree of return allows us to assume with some confidence that the responses of those who did reply can be considered to be representative of all Nevada science teachers. In other words, we have no reason to believe that the non-respondents would be unlike the respondents on any pertinent variables. For example, the percentages of non-respondents working in urban

counties (72%) and in rural counties (28%) was similar to the percentages of respondents in urban counties (70.4%) and in rural counties (29.3%). Likewise percentages of non-respondents teaching in different types of schools were not unlike the percentages of the respondents represented in these schools. A search of the literature has revealed one recent similar survey (Enochs, Oliver, & Wright, 1990). That four page survey was sent to 1,100 Kansas secondary science teachers. A return rate of 36.8 percent was achieved with no follow-up mailing. The results of this Nevada survey are discussed in the succeeding sections.

## Current Teaching Situation

### School Characteristics

Senior high school science teachers made up 52% of all respondents; 33% taught in either middle or junior high schools, 10% taught in combined junior/senior high schools and 5% taught in other types of schools (K-8, 6th grade center, K-12 schools, and intermediate schools).

Slightly over 70% of the respondents (243) were teaching in the urban districts of Clark and Washoe. Only 29% (101) were teaching in the remaining 15 rural districts. Of those teaching in urban districts, 11% (27) indicated that they taught in a rural school within an urban district.

When asked to describe the socio-economic background of students in their schools, 33% said a mix of different socio-economic levels, another 33% replied generally middle-class; 20% said generally low, 13% generally high and a few were not sure.

### Class Characteristics

Science teachers were asked to list the size of each of their classes. Over three hundred (330) respondents reported teaching 1,580 science classes. Three-fourths of the respondents indicated that that were teaching either five (43%) or six (32%) classes. The remaining respondents taught from zero to four classes. Fifteen respondents indicated that they were teaching no science classes that term. The mean of all class sizes was 24.4, with a range of 1 to 56. When average class size was viewed separately by type of school, there were virtually no differences. However, when examined by urban or rural location, it was clear that the average class size in urban districts (26.8) was larger than the average class size in rural districts (20.5). Nine out of ten of the classes with the largest average size (over 32 students) were urban. One urban sixth grade science teacher reported the largest average class size of 37.3 (six classes with a total of 224 students). An urban junior high school teacher (with an average class size of 35.3) reported the largest class with 56 students.

Table 1

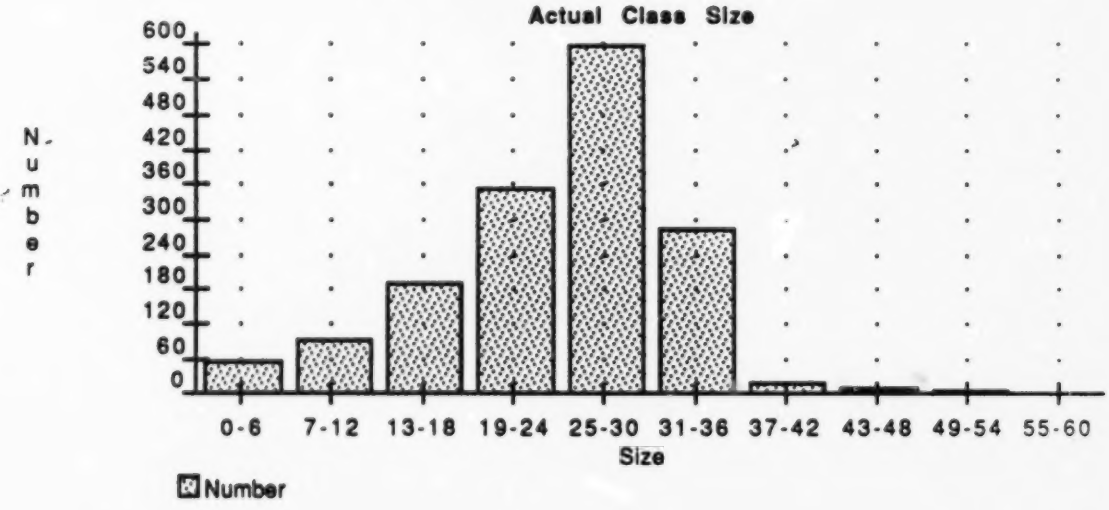
Average Class Size Reported by Science Teachers in Urban and Rural Locations

| | Urban | Rural | Rural in Urban* | All |
|---|---|---|---|---|
| Mean Class Size | 26.8 | 20.8 | 20.5 | 24.4 |
| Standard Deviation | 4.8 | 7.2 | 6.4 | 6.2 |
| Range† | 5 - 42.4 | 6.3 - 30.8 | 2.8 - 32.8 | 2.8 - 42.4 |
| Total Number of Respondents | 206 | 27 | 97 | 330 |

Note: * Rural schools in urban districts † Range of mean class size

A rural multi-grade science teacher reported the smallest average class size of 2.8 (four classes with a total of 11 students). This teacher also had the smallest class with only one student. Table 1 indicates average class sizes. Actual class size distribution is shown in Figure 1. Nine hundred science classes (56.9%) had twenty-five or more students.

Figure 1. Actual class size distribution



Specific Aspects of Teaching Situation

Teachers were asked to rate the adequacy of 16 specific aspects of their particular teaching situations. They indicated whether each aspect was very adequate, adequate, somewhat inadequate, or very inadequate. Table 2 shows the percentage of respondents who rated the aspects as either very adequate or adequate.

Table 2

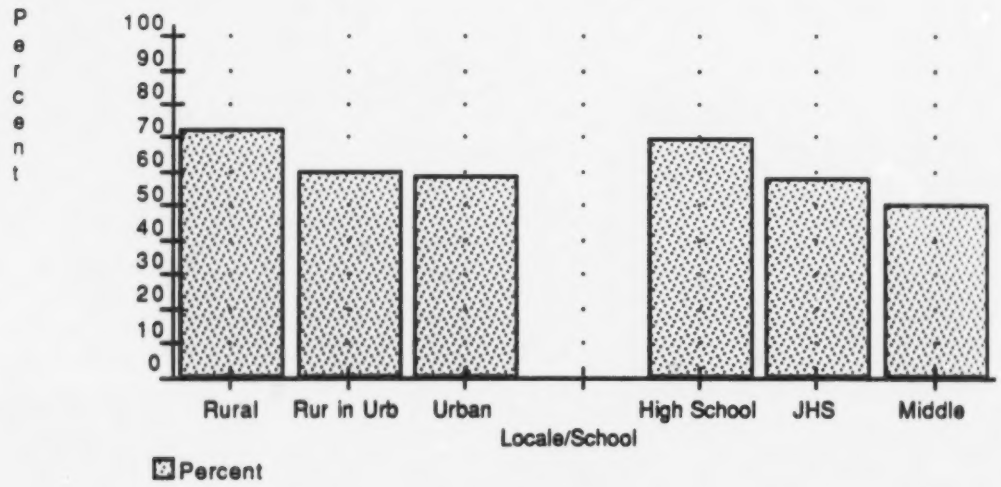
Aspects of Teaching Situation Rated Very Adequate or Adequate Listed by Percent and in Rank Order

| | |
|---|---|
| Science Course of Study | 76.2 |
| Audio-visual Equipment | 71.8 |
| Science Textbooks for Students | 71.0 |
| Opportunity to Update Teaching Methods | 70.7 |
| Library Facilities | 68.7 |
| Administrative Support for Science | 68.1 |
| Classroom Facilities | 63.8 |
| Opportunity to Update Science Information | 62.3 |
| Teacher Access to Computers | 59.7 |
| Audio-visual Materials | 57.4 |
| Storage Space | 53.4 |
| Laboratory Facilities | 43.2 |
| Funds for Science Materials | 42.0 |
| Funds for Science Equipment | 37.7 |
| Student Access to Computers | 35.1 |
| Appropriate Computer Software | 25.0 |

When the last five items in the table, those most frequently rated somewhat inadequate or very inadequate were examined separately by rural and urban districts and by type of school, it was discovered, that for the most part, these inadequacies were experienced equally everywhere. Exceptions were Funds for Science Materials and Funds for Science Equipment. Funds for Science Materials was more frequently rated inadequate by senior high school teachers (63.4%) than by middle or junior high school teachers (47.8%). Funds for Science Equipment received higher inadequacy ratings from teachers in

rural districts than from teachers in urban districts and from senior high teachers rather than middle or junior high teachers (see Figure 2).

Figure 2. Percent of Respondents Rating Funds for Science Equipment Inadequate by Rural vs. Urban School Districts and by Type of School




## Educational Background

Year of Completion of Original Undergraduate Preparation

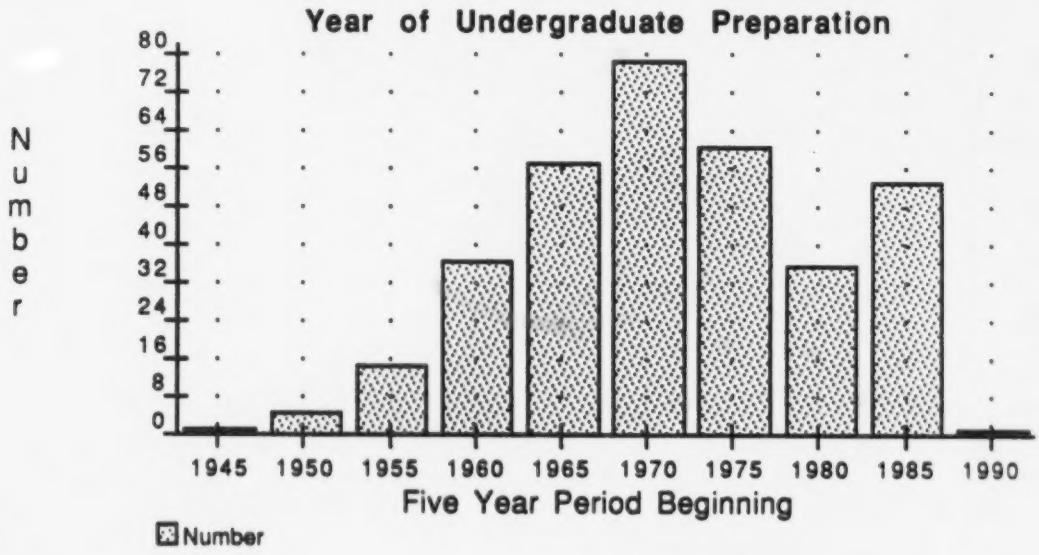
The year of completion of original undergraduate preparation ranged from 1947 to 1990. Over half of the respondents (55.9%) completed their initial undergraduate work prior to 1975–the corresponding percentage for high school science teachers is 62.7%. One-fourth (26.2%) of the responding science teachers completed their preparation within the last ten years. The corresponding percentage for high school teachers is 21.1%. Table 3 and Figure 3 show the distribution of the year of completion of original undergraduate preparation by five year periods.

Table 3

Year of Completion of Original Undergraduate Preparation by Five Year Periods

| From | To | Number | Percent | Cumulative Percent |
|---|---|---|---|---|
| 1945 | 1950 | 1 | 0.3% | 0.3% |
| 1950 | 1955 | 4 | 1.2% | 1.5% |
| 1955 | 1960 | 14 | 4.1% | 5.5% |
| 1960 | 1965 | 36 | 10.6% | 16.1% |
| 1965 | 1970 | 57 | 16.8% | 32.9% |
| 1970 | 1975 | 78 | 23.0% | 55.9% |
| 1975 | 1980 | 60 | 17.7% | 73.7% |
| 1980 | 1985 | 35 | 10.3% | 84.0% |
| 1985 | 1990 | 53 | 15.6% | 99.7% |
| 1990 | | 1 | 0.3% | 100% |

Figure 3. Year of Completion of Original Undergraduate Preparation by Five Year Periods.



Institution of Undergraduate Preparation

Nearly two-thirds (63.5%) of Nevada's science teachers received their undergraduate training out of state. Institutions attended include such far flung institutions as the Massachusetts Institute of Technology, Virginia Military Institute, City College of New York, and St. Mary's University, Canada. Nevada's science teachers received their undergraduate training from thirty-five of the fifty states. Half of UNLV's graduates received their undergraduate preparation prior to 1979. The corresponding median year for UNR's graduates was 1973. Half of the teachers who received their training out of state did so prior to 1972. Institutions cited by four or more science teachers are indicated in Table 4.

Table 4

Institution of Undergraduate Preparation

| Institution | Number | Percentage |
|---|---|---|
| UNR | 82 | 24.0% |
| UNLV | 43 | 12.6% |
| Brigham Young | 16 | 4.6% |
| Northern Arizona | 7 | 2.0% |
| Utah State University | 5 | 1.7% |
| Boise State University | 4 | 1.2% |
| Cal Poly | 4 | 1.2% |
| University of Idaho | 4 | 1.2% |
| University of Wyoming | 4 | 1.2% |
| Other Institutions | 173 | 50.3% |

Undergraduate Background in Science

Over two-thirds (69.0%) of the respondents had the equivalent of at least an undergraduate major in science. The figure is 72.7% for high school science teachers. Within this group a small number (6.1%) had a double major in science while 24.6% had both a major and a minor in a science area. Teachers with only a minor in science constituted 24.6% of the respondents. Only 5.5% of the teachers (2.8% of the high school science teachers) did not have at least a minor in a science area.

Undergraduate Background in Education

Three-fourths of the science teachers had at least 13 undergraduate semester hours of education coursework. High school teachers tended to have slightly fewer hours in education. Table 5 lists undergraduate semester hours of education coursework.

Table 5

Undergraduate Semester Hours in Education

| Semester Hours | Percentage |
|---|---|
| More than 24 | 40.9% |
| 13 to 24 | 35.7% |
| 12 or fewer | 6.7% |
| none | 14.8% |

Student Teaching

Over three-fourths (76.2%) of all respondents and 78.9% of the high school teachers reported having one or more science classes as part of their supervised training. The percentages for UNR and UNLV were 73.2% and 79.1% respectively.

Education in Science Areas

Nearly two-thirds (64.1%) of Nevada's science teachers reported some graduate work in science. Seventy percent of the high school teachers completed graduate level coursework in science. Table 6 and Figure 4 indicate undergraduate and graduate coursework in science.

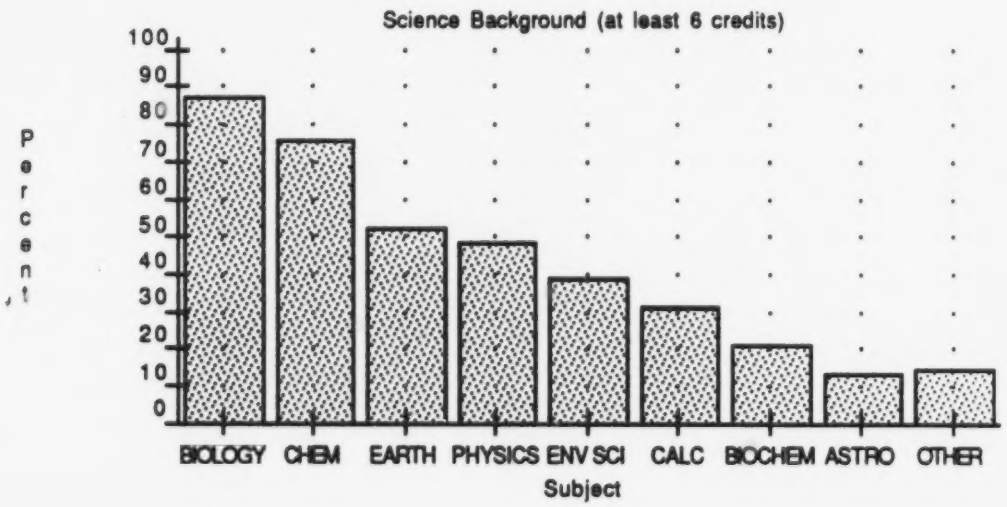
Table 6

Percentage of Respondents Reporting a Minimum of Six Semester Hours (Undergraduate and Graduate) by Science Area

| Area | All Respondents | High School Teachers |
|---|---|---|
| Biology | 86.7% | 84.4% |
| Chemistry | 75.1% | 76.7% |
| Earth Science | 51.6% | 48.9% |
| Physics | 47.5% | 51.7% |
| Environmental Science | 38.6% | 38.9% |
| Calculus Level Math | 30.4% | 30.6% |
| Biochemistry | 20.6% | 25.6% |
| Astronomy | 12.8% | 13.3% |
| Other | 13.9% | 12.2% |

Note: Other areas included Zoology (6), Geology (5), Botany (5), and Physiology (4)

Figure 4. Percentage of Science Teachers Reporting a Minimum of Six Semester Hours (undergraduate and graduate) by Science Area




Degrees Presently Held

Nearly half of Nevada's science teachers report advanced degrees–four have received their Doctorate. Table 7 lists the types of degrees held by the respondents.

Table 7

Types of Degrees Held by Nevada's Science Teachers

| Degree | Number | Percentage |
|---|---|---|
| Bachelor's | 342 | 99.1% |
| Master's | 165 | 47.8% |
| Specialist's | 13 | 3.8% |
| Doctoral | 4 | 1.2% |
| PDDSE | 7 | 2.0% |

Note: Three teachers did not respond to this item.

Future Degree Plans

Slightly over half (51.0%) of Nevada's science teachers report having future plans for advanced degrees. (Nearly half already have an advanced degree.) Over a third (36.5%) are seeking a Master's degree, 4.9% a specialist's, and 9.6% (33) plan to seek a Doctorate.

Preparation for Teaching

Half (49.9%) of the respondents reported completing an undergraduate program in a college or school of education with teacher certification. Almost one-third (30.1%) completed most or all of the coursework required for certification after their Bachelor's degree. About one out of six respondents (17.1%) completed an undergraduate program in an area other than education with teacher certification.

Quality of Teacher Preparation Program

Over half (55.7%) of all respondents felt that their teacher preparation program was good or excellent. Teachers who received their training out of the state felt better prepared than UNR or UNLV graduates (65.0%, 35.4%, and 46.5% respectively for good or excellent ratings). Almost half (45.1%) of the UNR prepared science teachers rated the quality of their teacher preparation program as mediocre or poor. The corresponding percentage for UNLV was 27.9%. For recent graduates the figures improve slightly for UNR (36.6% mediocre or poor for those graduating after 1973). Table 8 shows the ratings of the quality of teacher preparation programs.

Table 8

Science Teacher's Ratings of the Quality of their Teacher Preparation Program

| | Excellent | Good | Adequate | Mediocre | Poor |
|---|---|---|---|---|---|
| All | 21.2% | 34.5% | 17.7% | 17.7% | 8.7% |
| High School | 19.4% | 33.9% | 16.1% | 18.9% | 11.1% |
| Middle-JHS | 21.1% | 34.2% | 21.9% | 16.7% | 6.1% |
| UNR | 3.7% | 31.7% | 19.5% | 31.7% | 13.4% |
| UNLV | 7.0% | 39.5% | 25.6% | 18.6% | 9.3% |
| Out-of-State | 30.5% | 34.5% | 15.5% | 12.3% | 6.8% |

Note: The five possible choices were: (a) excellent, prepared me well for my first teaching assignment; (b) good, for the most part I was ready for my first teaching assignment; (c) adequate, I received the essentials; (d) mediocre, left too much to be learned on the job; and, (e) poor, almost a total waste of time.

Comments on the Quality of Teacher Preparation Programs.

A total of sixty-two respondents took the time to write optional comments. Almost half of the comments were directed against the teacher preparation programs that they experienced. These comments were strongly negative, highly critical and often caustic. Eighteen percent of the comments valued the student teaching portion of their preparation as superior.

1. Education courses had too much theory and not enough practice. (30 comments)

"Too much theory/history, etc. – no practical or realistic on the job stuff. Teachers should teach about teaching. Too much history and theory – not enough 'real life–what if.' Theories and classic teaching styles that one is exposed to in the university classroom are not what works or what is experienced in the real classroom. All theory taught, no application, no ideas or resources given which could be used in the classroom. I had NO idea how the school system worked at all. Too much theory [and] not enough application in education classes. No lecture course or methods course can prepare a person for the reality of teaching in an actual classroom situation. Much of the preparation was idealistic and too theoretical. Very little of the management and disciplinary skills I needed were addressed. While I feel it was excellent, nothing prepared me for the variety of types and levels of students I would encounter. Strategies for dealing with students with special needs were non-existent. In my graduate program I received instruction in this area, but it is needed in undergraduate level, or I feel a lot of possible

good teachers will be lost. UNR's quality of teacher preparation curse [sic] were a joke in the 1950s. My methods classes for my masters degree at UNLV was [sic] even worse! They were of no value. The science teaching program at UNR was useless. I have yet to put into practice anything I learned at UNR College of Education. I consider myself to be an excellent teacher in spite of the program. After having completed a BS from UNR, I didn't have a clue what I was getting into. Some classes at UNR were a waste. Many of the courses are taught by people that are out-of-touch with reality of teaching. If we want to improve education in general, we have to include revamping the college level as well. Wouldn't you want only the best to teach the up and coming teachers? The education professors lacked organization and goals in their course. Most ed profs have not recently, or ever, been in a rural classroom. Instructors were out of the secondary classroom too long to offer valid information. Not enough preparation in discipline or dealing with varying levels and learning styles. Very little on effective teaching method, classroom management, goal setting–elements of effective instruction.... Classroom control areas very weak and almost no help. Course work preparation very good. It just failed to prepare me for the classroom. Some things I encountered were never covered in classes. Nothing really prepared me for the grading and record keeping. I marked #5 [poor] for educational courses only. My other classes were excellent. Some education classes that I took were useless. I would have preferred using the credits for content training or practical educational training. No emphasis or time was spent on safety.No safety training, know [sic] 'How to' – all theory. Was not prepared for daily tasks and discipline techniques. We were only prepared for ideal situations. Too many hours spent in educational classes, they were a total waste of time. ...found many surprises in classroom management and reality. University coursework was a waste of time."

2. A few comments run against the grain. (5 comments)

"I was fortunate to have the past president of NSTA for science methods at Indiana University. Prof. Andersen did an excellent [job] of preparing us all. Had an excellent micro-teaching clinic at Northern Illinois University emphasizing various methods/models for teaching. Dr. Moor, NIU, DeKalb, ILL. I feel that I received excellent preparation for my first assignment but I know this was a result of my determination to get the most out of it. I patterned myself from my better instructors. I had excellent instructors and a good methods class."

3. Science preparation was regarded as beneficial. (5 comments)

"My science background was good but classroom preparation was lacking some. I was part of a pilot program at NAU which focused on the training of persons with science degrees to teach science. The program was most effective. I felt no inadequacies by having bypassed over 50% the course work

required of education majors. Preparation in my academic area of teaching was much more valuable. Excellent preparation in Bio. Science; poor teacher education courses. ...wasn't science specific enough."

4. The student teaching experience was generally rated as superior. (11 comments)

"The university should require fewer theoretical education courses that have little or no practical application. Instead require full semester student teaching with once a week PDC type classes. I had an excellent cooperating teacher. He taught me a great deal about class management, discipline, and teaching strategies. My student teaching experience was the only segment of my teacher preparation program that prepared me for becoming a teacher. Theories are fine but the thing that helped me the most was my student teaching. Thank God for a great cooperating teacher. Being in the schools and teaching is where you learn the most. There needs to be more of this long before the student teaching phase. I was fortunate to hook-up with an excellent master teacher when I did my student teaching. Course work was very inadequate but student teaching experience was the best. Student teacher experience was excellent. Student teaching was the most valuable experience and recommend Nevada extend student teaching to an additional 3 weeks to include opening and final exam preparation. More time should be spent in student teaching. Student teaching was the only productive experience. Student teaching and first 3 years of teaching were learning the profession by trial and error. Most valuable experience has been in the classroom and visiting many different teachers and see their styles."

5. Some student teaching experiences were negative. (3 comments)

"Student teaching was a bad experience; I saw my cooperating teacher maybe once a week. My student teaching was of the 'sink or swim' variety. The class work was okay. The student teaching class was a waste of time. I was never allowed to teach–just observe the master teacher."

6. Some teachers had classes for which they were unprepared. (2 comments)

"I had to teach some classes in Earth Science which I wasn't completely prepared for. Was thrown right into a chemistry program without any "formal" training."

7. For some teachers it was on-the-job training. (6 comments)

"Learned most from other teachers after I started teaching. I basically was left to fend for myself and I just happened to survive. [T]hese skills [effective teaching method, classroom management, goal setting] were built after my first teaching contract. I learned from trial and error. There is just no sub for

experience and on the job training. The real 'learning' and experience comes in the classroom."

8. Some comments were general and offered suggestions. (6 comments)

"Things have changed for the better since 1970. Teacher[s] today are much better prepared. Observation classes and teacher aide help [practicum?] is a great idea. Perhaps if they had more observations hours in the beginning of their programs... ...students intending to become teachers should be placed in teaching positions very early in their ed. program. Learning about teaching and doing it is not the same. Even now the PDC is unrealistic. If one knows the subject area well teaching should be natural. I had to go through both written and oral evaluations before I was admitted into the teacher education program at the university–only then could I take education courses."

Undergraduate Teacher Preparation Program

Nevada's science teachers were asked to evaluate the amount and quality of their undergraduate teacher preparation program in twenty-eight selected areas. Their responses appear in Table 9. In areas that differed substantially from the mean, the vast majority of the respondents were satisfied with the amount and quality of their science instruction (70.6% felt that the amount was about right and 88.2% judged the quality satisfactory or excellent). They were quite satisfied with their knowledge in biology (64.1% and 85.4%), chemistry (63.3% and 76.6%), and mathematics (56.7% and 71.5%). They were also mainly satisfied with their general liberal arts education (75.9% and 84.6%), the psychology of teaching and learning (58.8% and 65.1%), human growth and development (64.3% and 73.7%), and the history and philosophy of education (49.5% and 62.6%).

Nevada's science teachers were not satisfied with their preparation in classroom discipline (69.4% had little or no preparation and 64.0% judged what preparation they had as poor), techniques for helping students develop effective study habits (75.0% and 73.3%), techniques for developing better science reasoning skills (66.2% and 59.9%), and in motivating students to learn (66.3% and 60.9%). In terms of science skills or information, the respondents were not satisfied with their preparation in computer use in the sciences (90.9% had little or no preparation and 89.1% judged their preparation as poor or nonexistent), the use of supplementary curricula (81.1% and 76.1%), science, technology, and societal issues (63.7% and 56.2%), and in techniques for effectively dispelling student misconceptions about science (71.3% and 65.6%)

Table 9

Evaluation of the Amount and Quality of Specific Areas in the Undergraduate Teacher Preparation Program

| Area | Amount | Quality |
|---|---|---|
| Knowledge in Biology | 3.0 | 3.3 |
| Depth of Knowledge in Science | 2.9 | 3.3 |
| General Liberal Arts Education | 2.9 | 3.0 |
| Knowledge in Chemistry | 2.7 | 3.0 |
| Human Growth and Development | 2.7 | 2.8 |
| Science Laboratory Use | 2.6 | 2.8 |
| Knowledge in Mathematics | 2.6 | 2.8 |
| Psychology of Teaching and Learning | 2.8 | 2.7 |
| Knowledge in Earth Science | 2.4 | 2.7 |
| History/Philosophy of Education | 2.9 | 2.6 |
| Audio-visual Use | 2.4 | 2.6 |
| Teaching Strategies | 2.5 | 2.5 |
| Simple Demonstrations of Scientific Principles | 2.4 | 2.5 |
| Knowledge in Physics | 2.3 | 2.5 |
| Environmental Science Content and Processes | 2.3 | 2.5 |
| Problem Solving Methods | 2.4 | 2.4 |
| Discovery/Inquiry Teaching Techniques | 2.2 | 2.4 |
| Classroom Management | 2.2 | 2.3 |
| Comparative Learning Techniques | 2.2 | 2.2 |
| Classroom Discipline | 2.1 | 2.2 |
| Motivating Students to Learn | 2.1 | 2.2 |
| Science, Technology and Society Issues | 2.1 | 2.2 |
| Techniques for Developing Science Reasoning Skills | 2.1 | 2.2 |
| Techniques for Dispelling Student Misconceptions | 1.9 | 2.0 |
| Student Study Habits | 1.9 | 1.9 |
| The Use of Supplementary Curricula | 1.6 | 1.7 |
| Computer Use in the Sciences | 1.4 | 1.4 |
| Overall Average | 2.4 | 2.5 |

Note: The ratings were on a four point scale with the following values:

Amount of Preparation
1 = no preparation
2 = too little
3 = about right
4 = too much

Quality of Preparation
1 = no preparation
2 = poor
3 = satisfactory
4 = excellent

## Certification Status

Nevada Licenses

Most (92.4%) science teachers held secondary licenses, as would be expected. Over one-fifth (22.7%) also held special licenses, 9.6% had elementary licenses, and 5.5% were teaching with provisional licenses.

Science Endorsements

The vast majority of Nevada's science teachers have endorsements in Biological Science (54.8%) or Biology (39.4%). Nearly half (48.7%) have endorsements in General Science. Table 10 and Figure 5 indicates the distribution of science endorsements among Nevada's science teachers.

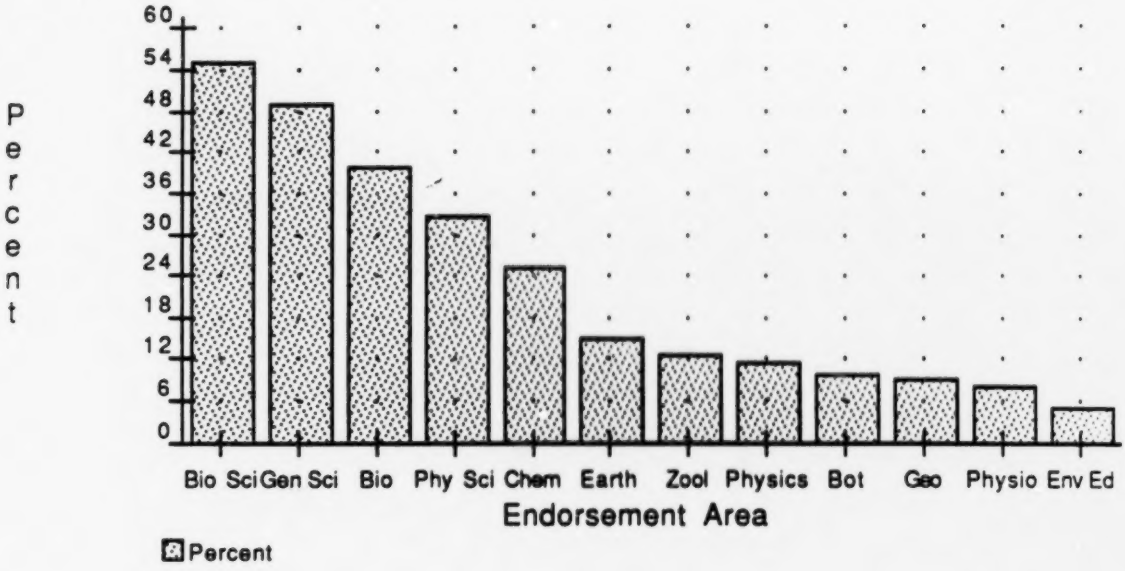
Table 10

Science Endorsements by Percentage of Respondents

| Endorsement Area | Percent |
|---|---|
| Biological Science | 54.8 |
| General Science | 48.7 |
| Biology | 39.4 |
| Physical Science | 32.2 |
| Chemistry | 24.6 |
| Earth Science | 14.8 |
| Zoology | 12.2 |
| Physics | 11.0 |
| Botany | 9.3 |
| Geology | 8.7 |
| Physiology | 7.8 |
| Environmental Ed | 4.6 |

Note: Most respondents have more than one endorsement; for this reason the total of the percentages is over 100.

Figure 5. Endorsement Areas Held by Science Teachers.




Other Endorsements

When asked whether they held other endorsements, 42.9% of the science teachers replied "yes". Twenty-seven different subject area endorsements were named. Table 11 shows those other endorsement frequently named by the respondents.

Certification in Other States

More than one-half (54.5%) of the respondents had been or were certified to teach in another state or country. Thirty-eight different states were mentioned. California was the most frequently named state. A list of frequently mentioned states is shown in Table 12. In addition to certification throughout the United States, nine persons had been certified to teach in other countries or territories. Those mentioned were: Guam, Australia, New Guinea, New Zealand, and Japan.

Table 11

Frequently Mentioned Endorsement Areas Outside of Science

| Endorsement Area | No. of Mentions |
|---|---|
| Mathematics or Math and Calculus | 31 |
| Administrative | 22 |
| Physical Education | 20 |
| Health | 18 |
| Social Studies | 15 |
| Driver's Education | 9 |
| Computer Science | 8 |
| English | 7 |

Table 12

Frequently Mentioned States in Which Nevada's Science Teachers are Licensed

| State | Number |
|---|---|
| California | 41 |
| Utah | 16 |
| Arizona | 12 |
| Oregon | 10 |
| Colorado | 10 |
| New York. | 8 |
| New Mexico | 6 |
| Michigan | 6 |
| Illinois | 5 |

Troublesome Licensing or Recertification Conditions

Respondents were asked whether any of the licensing/certification or recertification regulations in Nevada had been troublesome to meet. Ninety (26%) responded "yes"; 71 explained why. The explanations can be categorized as follows:

1. Problems with the Evaluation of Credits Earned (22 comments)

Problems with the evaluation of credits as they apply to the requirements of a particular endorsement (most frequently mentioned were the computer science, earth science, and physical science endorsements).

2. Problems Obtaining Courses Needed to Fully Qualify (16 comments)

Problems taking courses needed to fully qualify (limited number of courses offered at Universities in Nevada, few evening or summer courses, summer sessions start before school is out, hard to find physics or chemistry courses for teachers etc.)

3. Problems with Six Recertification Courses Previously Required (16 comments)

Problems completing the six specific recertification courses or resentment that these requirements were dropped after the individual had completed them.

4. Other Problems (17 comments)

Nevada Law and Constitution unnecessary. Difficult to meet timelines and money needed to obtain a license or to recertify. Stipends should be available. Some reciprocity should be in effect. More credit should be given for experience. Trouble notarizing documents. Requirements for specific endorsements keep changing. Current teachers should be grandfathered in when requirements are changed.

## Professional Career Activities

Full-time Years of Secondary Teaching (7-12)

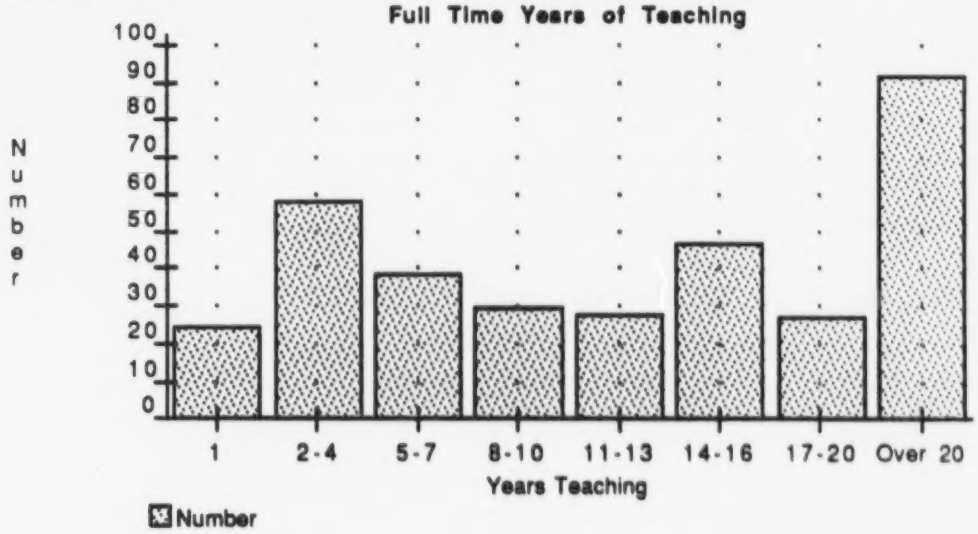
Over half (56.0%) of Nevada's science teachers have been teaching for more than 10 years. More than one-quarter (26.4%) have been teaching over twenty years. Nearly one-quarter are new teachers with less than five years of experience. Table 13 and Figure 6 show the number of years taught.

Table 13

Full-time Years of Secondary Teaching

| Years Teaching | Number of Teachers | Percent |
|---|---|---|
| One year | 24 | 7.0% |
| 2 - 4 years | 57 | 16.5% |
| 5 - 7 years | 38 | 11.0% |
| 8 -10 years | 29 | 8.4% |
| 11-13 years | 27 | 7.8% |
| 14-16 years | 46 | 13.3% |
| 17-19 years | 26 | 7.5% |
| 20 or more years | 91 | 26.4% |
| No response | 7 | 2.0% |

Figure 6. Number of Science Teachers Versus Years of Teaching.




Recent Professional Development Credit

The predominant mode of attaining professional development credit, within the past five years, was through in-service courses which were taken by 78.8% of the respondents. The next most frequent mode was university science courses taken by 60.0% of the respondents. Over half (56.8%) participated in continuing education courses. Slightly under half (46.7%) received credit for

university coursework in education. Less frequent modes were community college coursework (19.4%) and correspondence study (12.2%). Only 11 teachers (3.2%) received no professional development credit during the last five years while 43 or 12.5% received credit through other means.

When asked to indicate which of the above areas accounted for most of their credit, over one-fifth (21.2%) of the science teachers indicated that they received most of their credit through university science coursework. University coursework in education was second (16.8%) followed by in-service (12.5%). Continuing education was cited by 8.1% of the respondents while community college coursework was checked by 3.5%. Other methods of developing professionally that were cited included: Nevada Mining Conference Seminars, Nevada Science Project, Professional Committees, Project Learning Tree and Project Wild, Southern Nevada Writing Project, and Summer Science Teacher Institutes.

Professional Activities

Over half (55.9%) of the science teachers reported membership in a local, state, or regional science teachers association while slightly under half (48.7%) were members of a national science teachers association. A substantial number of respondents served on curriculum committees (144 or 41.7%) or textbook committees (135 or 39.1%). Many served as department chairpersons (129 or 37.4%) or as supervisors of student teachers (113 or 32.8%). Table 14 shows Nevada's science teachers' involvement in professional activities.

Table 14

Involvement in Professional Activities

| Activity | Number | Percent |
|---|---|---|
| Local/State science teachers association | 193 | 55.9% |
| National Science Teachers Association | 168 | 48.7% |
| Curriculum committee | 144 | 41.7% |
| Textbook committee | 135 | 39.1% |
| Department chair | 129 | 37.4% |
| Master teacher | 113 | 32.8% |
| In-service instructor | 44 | 12.8% |
| Association officer | 30 | 8.7% |
| Other activities | 45 | 13.0% |

## Career Choice

Participants were asked to rank order their main considerations in choosing teaching as a career. They were given thirteen choices and a blank open ended choice. Three choices stand out: (1) Interest in science was named by 256 teachers, (2) a desire to work with young people was named by 252 teachers, and (3) an opportunity to provide an important service was cited by 198 teachers. The ranking of all the considerations and the first place choices follows in Table 15. Figure 7 indicates the distribution of considerations in choosing science teaching as a career.

Table 15

Motives for Teaching Science

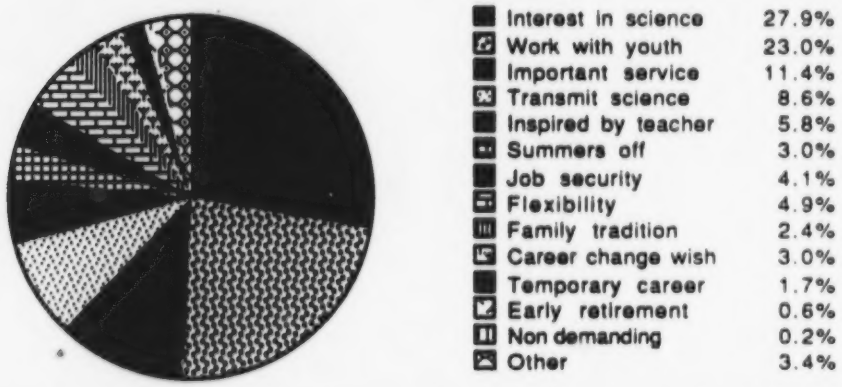
| Consideration | No. 1st place choices | Percent | Ranking Points |
|---|---|---|---|
| Interest in science | 130 | 37.7% | 2307 |
| Work with youth | 107 | 31.0% | 2203 |
| Important service | 53 | 15.4% | 2163 |
| Transmit science | 40 | 11.6% | 1337 |
| Inspired by teacher | 27 | 7.8% | 1020 |
| Summers off | 14 | 4.1% | 979 |
| Job security | 19 | 5.5% | 914 |
| Flexibility | 23 | 6.7% | 749 |
| Family tradition | 11 | 3.2% | 460 |
| Career change desire | 14 | 4.1% | 456 |
| Temporary career | 8 | 2.3% | 178 |
| Early retirement | 3 | 0.9% | 137 |
| Non demanding | 1 | 0.3% | 99 |
| Other | 16 | 4.6% | 319 |

Note: Ranking points were determined by allocating 10 points for first place, nine for second, etc. Other choices included: coaching (8), location (3), exposure to poor teaching (2), challenge, idealism, and ignorance.

## Professional Description

Most of the respondents described themselves as "a science teacher" (48.4%) or "primarily a science teacher although I may teach some other classes from time to time" (13.9%). Other descriptions included: "both a science teacher and an [other] teacher" (21.2%), and "primarily an [other] teacher who also teaches some science classes" (8.4%). Other descriptions were selected by 6.1% of the respondents.

Figure 7. Considerations in Choosing Science Teaching as a Career




Note: Percentages reflect the proportion of ranking points for each category.

Awards and Recognition

Nearly half of Nevada's science teachers have received awards or other types of recognition. Over three hundred nominations, awards, or other types of recognition were mentioned. Among these are:

Teacher of the Year Awards [various] (31 citations)
Presidential Award for Excellence in Science Teaching (21 nominations - 6 awards)
Teacher of the Month Awards [various] (16)
Science Teacher of the Year [various] (13)
Excellence in Education Award [Clark County School District] (12)
UNLV In Search of Excellence Summer participant (10)
Outstanding Biology Teacher of the Year in Nevada [NABT] (5)
First Year Teaching Award (5)
Student Teaching Award (4)
Mini Grant recipient (4)
U. S. Department of Energy Science Now participant (4 times)
NEWMAST participant (3)
Outstanding Educator [various] (3)
Outstanding Chemistry Teacher (2)
Christa McAullif Fellowship recipient (2)
Conservation Teacher of Nevada [NWF]
Dreyfus Master Teacher
Environmental Teaching Award
Nevada Physics Teacher Resource Agent
Operation Physics State Representative
Outstanding Physics Teacher
Rutgers Physics Institute

Southern Nevada Writing Project Fellowship
Teacher in Space Program–NASA recognition
U. S. Department of Energy Research Award
U. S. Department of Energy TRAC Award
Val Arredondo Teacher Rights Award

## Personal Information

Gender, ethnic status and age data were collected for each respondent. Close to two-thirds (62.6%) of the science teachers surveyed were male, over 90% were white and the majority (68.4%) were between the ages of 31 and 50.

It is of interest to note that when gender was correlated with age, a higher percentage of female science teachers was apparent in the younger age groups than in the older age groups. When the age and gender relationship was viewed separately for the rural counties and the urban counties, female science teachers were in general more highly represented in urban districts, and most highly represented among younger science teachers in urban districts. Figures 8 and 9 indicate the disparity by gender among Nevada's science teachers.

Figure 8. Age and Gender of Nevada's Science Teachers.

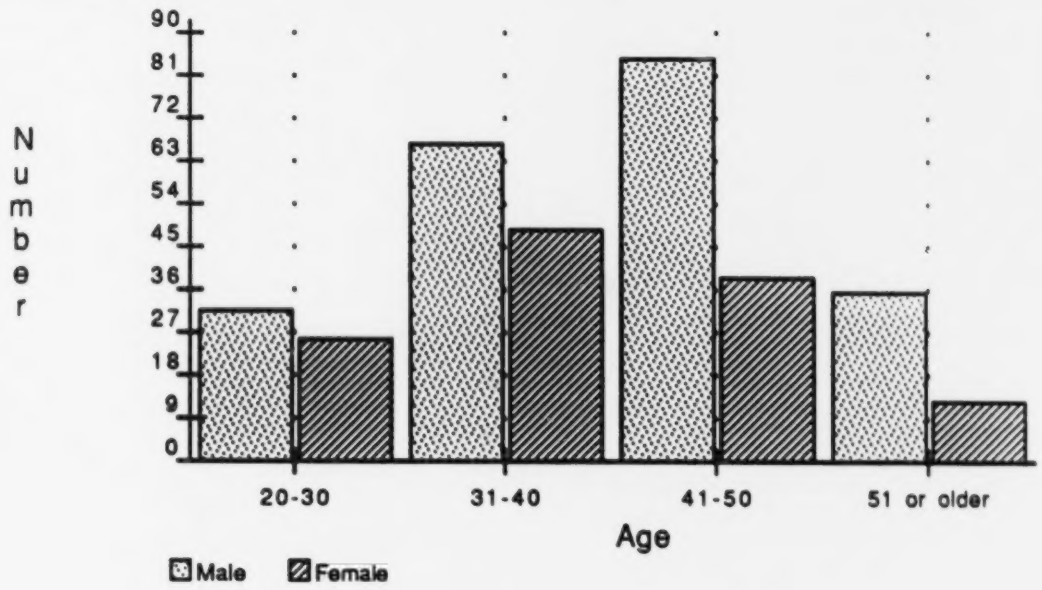
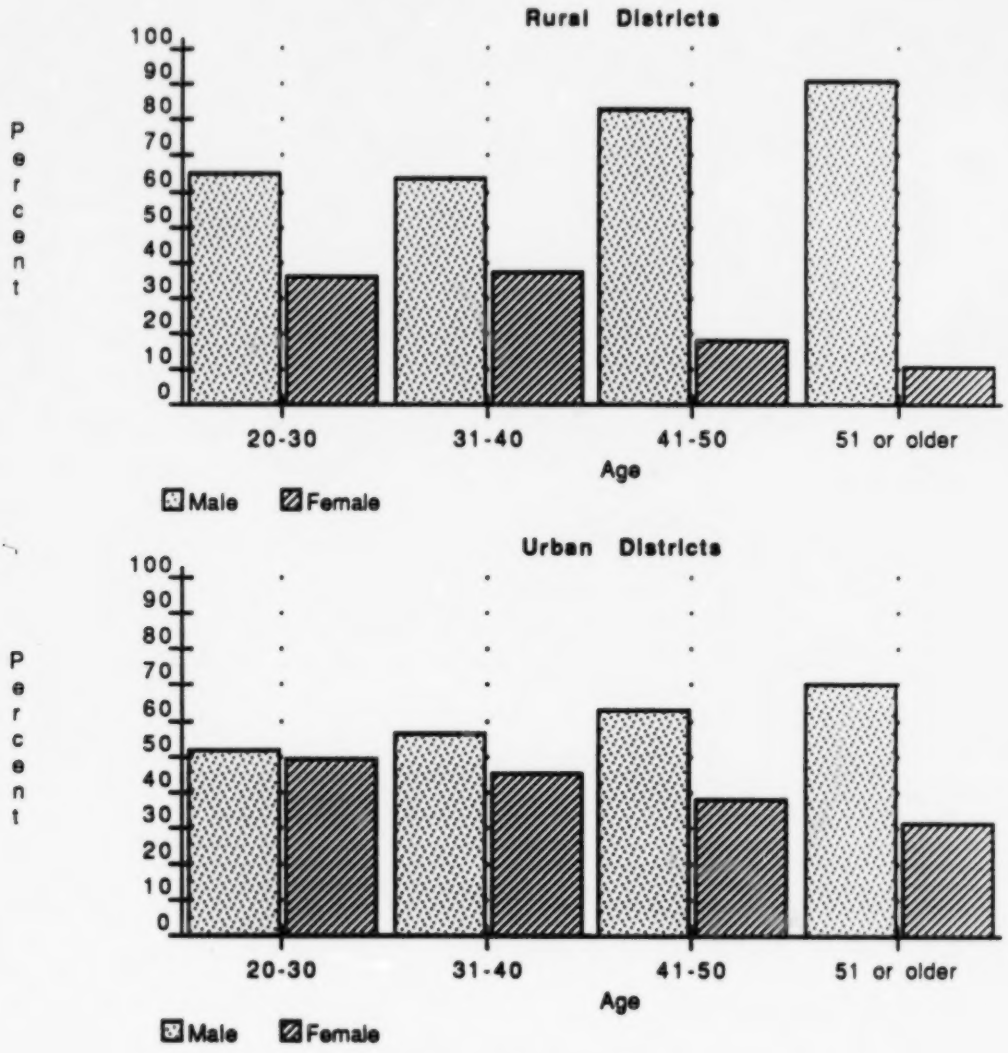


Figure 9. Age and Gender of Science Teachers by Rural-Urban Districts.




## Opinions and Suggestions

Significant Contributions to Improving the Quality of Teaching

Almost two-thirds (64.3%) of the respondents reported that a course, professional development session, workshop, or some other learning experience significantly contributed to improving the quality of their classroom teaching. It appears that high quality summer workshops such as National Science Foundation sponsored institutes and the Nevada Science Project had a significant effect on Nevada's science teachers. Other summer

experiences that contributed to the growth of Nevada's science teachers were UNLV's Excellence in Education Program and UNR's Summer Institutes. Several of these programs were sponsored by Nevada's Gaming Foundation. Professional development centers, courses, and workshops throughout the state were frequently cited as having a significant contribution to improving the quality of Nevada's science teachers. The student teaching experience was for several science teachers the most significant learning experience that they had. Topics receiving the most interest related to cooperative learning, assertive discipline, environmental science, classroom management, computer education, and critical thinking. Experiences cited by more than one respondent included:

NSF (or similar) summer institutes (18 citations)
Bob Tierney writing across the curriculum workshops [Nevada Science Project] (17)
Professional Development Centers or Courses (17)
Student Teaching (13)
Cooperative learning (7)
Assertive discipline training (6)
Inservice - general (6)
Environmental Science Education Classes/Programs (5)
National Science Teachers Association Conventions (5)
Other writing process/project workshops (5)
UNLV Excellence in Education program (4)
UNLV summer science seminars/courses (4)
UNR summer institute on mining/geology (3)
Classroom management techniques (2)
College methods course (2)
Computers in the classroom (2)
Nevada Gaming Foundation Institutes (2)
Nevada school law (2)
Science Methods Course (2)
Teaching undergraduate methods in college (2)
Continuing Ed classes Science/Math (2)
UNR Gaming Institute for Physics (2)
Teaching for Critical Thinking (2)

<u>Highest Priority Training Needs</u>

The teachers were asked to consider their most important needs for additional training/assistance/education and to suggest their highest priorities for the content of Professional Development Sessions, Summer Workshops, Master's Degree Program in Science Education, and Revisions to the Secondary Course of Study-Science. Confusion relating to the section on Revisions to the Secondary Course of Study-Science caused those responses to be of no value.

Professional Development Sessions.

A total of 124 science teachers (36% of all respondents) took the effort to respond in this category. The largest number (32 or 26% of those writing comments) of responses suggested sessions dealing with classroom management and discipline. The largest combined response area concerned strategies for effectively teaching science. Areas mentioned most frequently under knowledge in science included environmental science education, chemistry, biology, physics and mathematics. Comments suggested that science content should be appropriate subject matter for students and that courses should be made available to the rural areas and at times that teachers could attend during the evenings and summers. Other responses included:

| | |
|---|---|
| Science teaching techniques, methods and strategies | 22 responses |
| Lab safety, use, techniques, skills and the use of demonstrations | 18 |
| Knowledge in science areas | 17 |
| The use of computers and technology in science | 17 |
| Techniques and ideas for motivating students | 13 |
| Methods of problem solving/critical thinking skills | 11 |
| Techniques for teaching science through discovery or inquiry | 11 |
| Working (brainstorming) with other teachers on release time | 8 |
| Cooperative learning | 7 |
| Hands on science activities | 7 |
| Developing better science reasoning skills in students | 6 |
| How to cope with today's students (gangs, alcohol, drugs, depression) | 6 |
| Learning styles and techniques | 6 |
| Teaching students effective study habits | 6 |
| New methodology and ideas | 3 |
| Science-Technology-Societal issues | 3 |
| Time management skills for teachers | 3 |
| Use of supplementary curricula | 3 |
| Techniques for dispelling science misconceptions in students | 2 |
| Student and group projects | 2 |

Summer Workshops.

The recommendations in this area are similar to those for professional development sessions. 96 teachers took the extra effort to comment in this area. Most of the responses suggested courses in science content areas including: nine responses seeking knowledge of recent advances or developments in science, eight regarding general content knowledge, eight for chemistry, five for environmental science education, and five for physics. Other areas mentioned were ecology, botany, biology, earth science, and mathematics. General comments urged that NSF type summer workshops be supported and that summer workshops in general be announced well in advance.

General responses for suggested summer courses included:

| | |
|---|---|
| Lab safety, use, techniques, skills and the use of demonstrations | 26 responses |
| The use of computers and technology in science | 16 |
| Hands on science activities | 9 |
| Science teaching techniques, methods and strategies | 9 |
| Developing better science reasoning skills in students | 5 |
| Exposure to new ideas and methods | 5 |
| Supplementary curricula | 5 |
| Techniques for teaching science through discovery or inquiry | 5 |
| Classroom management and discipline | 4 |
| Methods of problem solving/critical thinking skills | 4 |
| Careers in science | 3 |

Master's Degree Program in Science Education.

A total of 154 teachers indicated a program area preference (see Table 16). A total of 24 teachers chose to make specific comments relating to the content of this program.

Table 16

Program Area Preferences for a Master's Degree

| Preference | Number | Percentage |
|---|---|---|
| Biology | 65 | 42.2% |
| Earth Science | 41 | 26.6% |
| Chemistry | 29 | 18.8% |
| Physics | 19 | 12.3% |

Comments included suggestions for the scheduling of classes such as evening courses in all areas of science, summer programs, and availability to the rural areas. Comments regarding the constitution of the program suggested internships, mentorships, master teachers' workshops, the use of practical material, "real meat and potatoes type" courses and not "watered down programs" as well as appropriate science courses "in tune with the needs of the students - grade level" and subject matter related "to your students not universities." Non-content suggestions included study habits, laboratory techniques, learning techniques, problem solving and critical thinking skills, teaching strategies relating to science, better science and reasoning skills, discovery and inquiry, safety in the laboratory, history and philosophy of

science, human growth and development, outdoor education, and current research and discoveries.

Suggested Changes in Work Situation

Respondents were asked the following question: Most of us experience restrictions of one kind or another in our work situations which prevent us from doing the job as we would like. What changes would be necessary in your current work situation in order to make your job more ideal?

The total number of science teachers who responded to this open-ended question was 194 or 56.2% of all respondents. A wide range of suggestions for changes was offered. Examples of the most common responses are presented by category and in rank order.

1. Class/Laboratory/Classroom Facilities (65 comments)

"Proper set-up/space/equipment/materials. Proper lab set-up. Lab in room other than classroom. More labs. Larger, better equipped rooms-gas hoods, AV equipment, library books. More space. Adequate storage, materials. Enlarged stock room systematized. Have my own classroom. Classroom to teach in-not just lab. Need to be in classroom at least half a day. Accessibility of lab to room. A lab of my own; not have to share. Decent, updated textbooks. Up-to-date films. Restructuring of science rooms, lab tables. Improved methods for getting supplies. Better environmental conditions-ventilation, air conditioning, etc."

2. Class Size (43 comments)

"Reduce class size, especially in labs."

3. Funding (31 comments)

"Funding for materials and equipment, for labs, for needs as we see them. Better distribution of budgets in school. Bigger budget. If state mandates computer courses, then fund [them] for success. Funds for field trips. Funds for hands-on projects."

4. Standards for Students (25 comments)

"More stringent standards for students. Student discipline. Get rid of those who don't desire to learn. Freedom to remove disruptive students. Better ways to deal with disruptive students. Student apathy. Students don't care. Lack of student motivation. Non-compulsory education at this level. Make education mandatory only until the 8th grade. More support for teachers from Dean's office. More support from Dean's office on chronic tardies.

Stronger tardy and absence policies. Make passing science a requirement to pass a grade, as are English, math and reading. Students work 20-40 hours a week, sleep in class, don't participate. Tie driving license to credits in school. Need alternative schools."

5. Teacher Autonomy (24 comments)

"Less restriction by curriculum, syllabus. More freedom to teach. More flexibility in teaching environment. Respect for right to work with students, staff, and community in variety of ways to help most achieve. More teacher autonomy. Less administrative control. More competent administrators. Administrators shouldn't dictate to teachers. Superintendents and principals who are accountable. More supportive administrators. No guidance or alternatives on what can be taught."

6. Time Constraints (22 comments)

"More time to plan current curriculum. Teach four classes, not five. More time to prepare/examine materials/make classes more interesting. Have 2 to 3 preparations maximum. Need to know earlier, before school year starts, just how many and what teaching preparations. Need lab period and preparation period. Teach fewer than seven classes. Make science fairs optional; time required affects curriculum."

7. Non-Teaching Duties (21 comments)

"Less administrative paper work of all kinds. Assistance in paper grading and paper management. Fewer classroom interruptions for such things as attendance paperwork. Eliminate extra duties. Don't want to monitor halls/restrooms. Eliminate lunch duty/bus duty. Not so many extra-curricular activities."

8. Organization of Science Courses (17 comments)

"Full year courses, not half years. Need year education program in secondary education. Year-round teaching. More flexible time schedule, for example, two hour blocks of science for better use of lab time. One and one half hour class periods. More lab time. Two hour classes for A.P."

9. Aides (14 comments)

"Lab assistant or adult aide to help set up labs/answer students' questions or lab teaching with a free period for setting up before. An assistant to help with correcting, filing, typing, bulletin board."

10. Ways to Improve Teaching (13 comments)

"Exchange ideas with other teachers/released time for this. Better communication among peers. Ideas from fellow teachers on methods/labs. Someone to share lab activities with me--useful in physics, chemistry, earth science, with appropriate materials for each. More inservice training. Ability to take more science courses in related fields. Better teacher cooperation/professionalism. A more professional attitude by staff toward teaching as a profession. Cooperation of all science teachers in the district--evaluation of our needs."

11. Curriculum/Testing Changes (11 comments)

"Integrated physics, chemistry topics. Lack of coordination in science curriculum [grades] 6-12. Modify curriculum for 7th grade; too much to cover as students lack basic preparation in grades 1-6. More remedial work in earlier grades. Prepare in lower grades--attitudes and behaviors for learning. Not to teach to SAT or ACT exams. A 6th grade test that closely follows the curriculum. Better screening by counselors for students taking Biology I and Biology II. Need more faculty to teach different elective courses that should be taught. More advanced classes offered to higher level students."

12. Computer Facilities/Needs (10 comments)

"Computer facilities/laser disk/computer software. Access to computer lab. A computer lab in the science lab. More computers. A computer in my classroom."

Other subjects, less frequently mentioned, included: increased remuneration, parent and community support, more support services/private office facilities, more field trips, more flexibility in course requirements for licensing, dissatisfaction with current teaching assignments, and the desire to change schools radically.

Final Comments (Optional)

Seventy-five or 22% of all respondents offered additional comments at the end of the survey. These can be divided into three areas: (1) suggestions for higher education (32 comments); (2) suggestions regarding teaching situations (31); and, (3) other; personal comments, comments about the questionnaire (22).

The higher education comments included: better scheduling of courses to fit teachers' schedules, improved quality of teacher preparation courses in general, pre-service suggestions (teaching strategies and techniques, student teaching in a variety of settings, science education for special education

teachers, fully inform and screen prospective teachers), and in-service suggestions (teacher training in lab activities, use of computers in science, and videotapes of actual teaching situations).

The current teaching situation comments included: the need for increased funding for the science program, concern about students' attitudes, the need to change the organization and methods of science teaching, increased pay, the need for greater administrative support and opportunities to keep up-to-date.

## Summary and Conclusions

Fifty-two percent of the science teacher respondents taught in senior high schools. Slightly over 70% taught in one of the two urban districts in the state. The majority identified their students as being either "generally middle-class" or "a mix of different socio-economic levels". The overall mean class size was 24.4; for urban teachers the mean class size was 26.8, for rural teachers, 20.8.

When respondents were asked to rate 16 specific aspects of their teaching situations, those aspects receiving the least favorable ratings were:

- Appropriate computer software
- Student access to computers
- Funds for science equipment
- Funds for science materials
- Laboratory facilities

Today's science teachers completed their undergraduate preparation over a range of 43 years from 1947 to 1990. One-half completed this work before 1975. Over two-thirds (69%) had the equivalent of at least an undergraduate major in science, one-fourth (24.6%) were teaching with just a minor in science, and 5.5% with less than a minor in science. Most (76.2%) science teachers reported having taught science classes during their student teaching experience. Almost half of Nevada's science teachers hold master's degrees and slightly over one-half plan to obtain an advanced degree in the future. Almost 56% of respondents rated their teacher preparation program as excellent or good, 17.7% indicated that their preparation was adequate, and 26.4% rated their preparation program as mediocre or poor. When asked to evaluate specific areas of their undergraduate teacher preparation program, greatest satisfaction was expressed with the amount and quality of preparation in science instruction per se (e.g. biology, chemistry), as well as general liberal arts education and human growth and development. Least satisfaction was expressed with the amount and quality of preparation provided in computer use in the sciences, the use of supplementary curricula, techniques for dispelling student misconceptions and in areas dealing with student-teacher

relations and pedagogy (e.g., classroom discipline, helping students acquire good study habits, and motivating students).

Most science teachers (92.4%) hold secondary licences. Close to one-third also hold other kinds of licenses such as elementary or special. The most commonly held endorsements on licenses were:

- biological science
- general science
- biology
- physical science
- chemistry

More than one-half (54%) of the respondents either had been or were currently certified to teach in some thirty-eight other states, as well as several different countries.

The median number of years of teaching experience of Nevada's science teachers was 13. Over one-half had taught for more than 10 years. Approximately one-fourth had less than five years of experience. The predominant mode of attaining professional development credits was through in-service courses followed by university science courses, continuing education courses, and university education courses. Slightly over one half of the science teachers were, or had been, members of a local, state or regional science teacher association. Almost one half were, or had been, members of a national science teacher association. Approximately 40% had served on curriculum or textbook committees, and 37% had been Department Chairs. Approximately one-third had been supervisors of student teachers.

The main considerations in choosing teaching as a career were the following:

1. interest in science
2. desire to work with young people
3. opportunity to provide an important service

Nearly two-thirds defined themselves professionally as either science teachers or primarily science teachers. Almost one-half of Nevada's science teachers had received an award or other type of recognition related to their teaching.

Almost two-thirds of Nevada's science teachers are males, over 90% are white, and the majority are between the ages of 31-50. More female science teachers were found in the younger age groups, with the highest percentages belonging to younger age groups in urban districts.

Nearly two-thirds (64.3%) of the respondents indicated that some particular learning experience had significantly contributed to improving the quality of their classroom teaching. Forty-two specific learning experiences were listed, ranging from NSF Summer Institutes to Wilderness Canoe Base in Northern Minnesota. High quality summer workshops such as National Science Foundation sponsored institutes and the Nevada Science Project had a significant effect on Nevada's science teachers. Other summer experiences that contributed to the growth of Nevada's science teachers were UNLV's Excellence in Education Program and UNR's Summer Institutes. Several of these programs were sponsored by Nevada's Gaming Foundation. Professional development centers, courses, and workshops throughout the state were frequently cited as having a significant contribution to improving the quality of Nevada's science teachers.

Nevada's science teachers report that the most needed areas of professional development are:

- science teaching strategies and techniques
- laboratory safety and use
- knowledge in science content areas
- the use of computers and technology in science
- techniques and ideas for motivating students.

When asked to describe specific changes in their teaching situations which would be necessary for them to do their best job of teaching, 194 or 56% of the respondents replied. The most frequently mentioned suggestions were:

(1) improve laboratory and classroom facilities including space, equipment and materials;
(2) reduce class size, especially in laboratories;
(3) increase funding for materials/equipment/laboratories;
(4) institute higher standards for students;
(5) provide more autonomy for teachers;
(6) provide more planning/preparation time; and,
(7) remove non-teaching duties such as paperwork and monitoring.

## Recommendations

Professional Development Support

An impressive two-thirds of Nevada's science teachers reported learning experiences that significantly contributed to improving the quality of their classroom teaching. High quality summer workshops such as National Science Foundation sponsored institutes (and similar types), the Nevada Science Project, UNLV's Excellence in Education Program, UNR's Summer

Institutes and other programs sponsored by Nevada's Gaming Foundation and the Mining Industry were mentioned as contributing to the improvement of science education in Nevada. Professional development centers, courses, and workshops throughout the state were also cited as having a significant effect.

It is recommended that continued and expanded support be given to those programs cited as beneficial. Several respondents report that these programs should be addressing the needs of Nevada's rural counties as well as the southern and northwestern areas. Support should be given to programs that incorporate training in science teaching strategies and techniques, laboratory safety and use, knowledge in science content areas (environmental science education, chemistry, biology, ecology, physics and mathematics, in particular), updates in recent scientific and technological advances, the use of computers and technology in science, methods of problem solving and critical thinking skills, techniques for teaching science through discovery or inquiry, and techniques and ideas for motivating students.

Laboratory and Classroom Facilities

The largest number of comments regarding changes necessary in order to enable Nevada's science teachers to do a better job centered around improvements in the laboratory and classroom facilities. A serious safety concern was voiced by many teachers. Inadequate space for laboratories and inadequate environmental conditions (ventilation, lab tables, and space utilization, for example) troubled several science teachers. Adequate storage facilities, sufficient lab equipment and proper safety equipment were other matters of importance. Recent innovations in lab technology have not been seen in Nevada's public school science labs. The practice of having science teachers float from room to room or to switch with other teachers in order to perform science experiments leads to decreased use of the lab as a learning device and unsafe hurried practices in the few lab activities that take place.

The National Science Teachers' Association (NSTA, 1990) points out that all middle level and high school science courses "must offer laboratory experiences for all students." At the middle level the recommendation is that "a minimum of 80 percent of the instruction time should be spent on laboratory-related experiences." At the high school level the recommended amount of laboratory time is 40 percent." The NSTA position statement on facilities and equipment insists that:

> An adequate budget for facilities, equipment, supplies, and proper waste management must be provided to support the laboratory activities. Equipment and facilities must be maintained and updated on a regular basis. Unique instructional supplies must be provided in sufficient quantity that students have a direct hands-on experience. (p. 3).

The NSTA position statement on classroom space suggests that:

> Science should be taught in a space specifically dedicated to science classes with provisions for laboratory activities. A safe and well-equipped preparation and work space for students and teacher must be provided. Adequate storage space for equipment and supplies, including a separate storage area for potentially dangerous materials, must be provided. (p. 3)

It is recommended that a survey visit be conducted of science facilities in Nevada's public schools. National safety standards exist and could, along with the NSTA Position Statement on Laboratory Activities, form the basis of the survey. Visits to Nevada's rural schools could be coupled with training in lab use and lab safety. The goal of the survey would be to upgrade Nevada's science classrooms and labs so that the processes of science could be explored As one surveyed teacher commented, "Science is a process, it must be taught as such." It can't be taught as such unless adequate and safe facilities are available.

Class Size

The issue of class size was second only to the need for proper facilities or equipment in the recommendations for changes in current work situations expressed by Nevada's science teachers. The emphasis in most of these comments was upon the problems of teaching large classes in the laboratory situation. Factors such as inadequate amount of equipment, inability to give individual attention, discipline and safety were also mentioned. Although the overall mean class size was 24.4, nine hundred science classes (56.9%) had twenty-five or more students.

The attention in Nevada and a number of states in recent years has been on reducing class size in the early grades. In fact, class size research has been conducted on both the elementary and secondary levels in the past. In a well-known meta-analysis of the research on class size (Glass & Smith, 1978), it was found that the class-size and achievement relationship was consistently slightly stronger in the secondary grades than in the elementary grades.

It is recommended that the reduction of class sizes in particular learning situations, such as science laboratories, be set as a goal to be implemented as soon as feasible. Several states have implemented a limit such as 24 students in classes where one-fourth of the learning time is spent in labs or other student activities. The NSTA (1990) position statement recommends that the "number of students assigned to each laboratory class should not exceed 24." Many of the benefits of small classes discussed in the literature on the subject, such as greater individualization of instruction, easier classroom management, quicker feedback and reteaching, would be very applicable to

the laboratory situation and should be expected to result in greater achievement by students.

Science Materials and Equipment

Coupled with the changes cited under laboratory and classroom facilities above, improvement in this area will enable Nevada's science teachers to better meet the needs of their students and their profession. Audio visual equipment, library and research books, journals, and materials, updated textbooks were all cited as items that are in substantial need of improvement. A related issue is the woeful lack of computers and software in the science lab and classroom. Increased funding was mentioned as a crucial necessity in this area. The NSTA position statement cited under laboratory and classroom facilities applies to equipment as well. Science education is an area that requires an outlay of funds if it is to be done correctly so that we may move toward the national education goal of being "first ... in science achievement" by the year 2000.

Two years ago the University of Nevada at Reno added a significant educational technology component to the secondary science methods course. It includes the use of optical data technology in the classroom including both CD-ROM and interactive video laserdisc.

It is recommended that the State Department of Education explore the ramifications of implementing a practice of adequate and equitable funding of science departments and programs throughout the state. This funding should be based on pupil attendance and enrollment in science classes. State standards on equiping science labs and classrooms, including the use of computers in science education, should be established and followed. Districts and schools should be encouraged to exceed any state supported funding criterion. Industry support of local science departments should be explored and encouraged by the State of Nevada at all levels.

Autonomy for Teachers

Many science teachers reported being unduly restricted by stale and repetitious curriculum and by extensive and expansive syllabi. Science content knowledge is increasing at enormous rates. It is impossible to revise and keep up with demands to cover this ever changing content. National trends are to cover fewer concepts but to cover them in depth, so that meaningful and lasting learning occurs. Additional concerns occur when science fairs are mandated by the administration. Nevada's science teachers are seeking more freedom and flexibility in teaching science to meet our student's needs and our nation's goals.

It is recommended that Nevada implement a program of study that is broad and flexible, one that stresses depth over breadth, one that is flexible enough to permit inquiry and discovery in the science lab, and one that focuses on the major conceptual schemes of science. Inservice workshops and professional development programs to update, inform, and assist science teachers on these issues should be developed and guided from the state level.

More Planning and Preparation Time

It is most distressing to hear that science teachers resort to the teaching of facts and the book learning of science because of time pressure. Hands on activities require more time to prepare, organize, and implement than does book learning. More than two preparations in science drains teachers of their stamina and spirit and drives them into a teacher-centered activity free curriculum. Lab courses should be established with an additional preparation period for the maintenance and upkeep of the lab and storage facilities and for safety purposes, as well as the additional time required to adequately prepare for laboratory exercises. The NSTA (1990) position statement on laboratory activities recommends that "no more than two different preparations should be assigned to the teacher for any academic term." and that "a competent paraprofessional should be provided to assist with preparation for laboratory experiences."

It is recommended that the State Department of Education explore the possibility of providing for additional prep periods for teachers of science courses with lab components. A restriction of two preparations for these teachers should be encouraged where feasible. The possibility of utilizing lab assistants in order to optimize science teachers' time could also be explored. Finally, science teachers have a special obligation to prepare in advance for new courses they may be required to teach. As much advance time as possible should be given to these teachers.

University Teacher Preparation and Teacher Support Programs

Many of Nevada's science teachers were not satisfied with their undergraduate teacher preparation training. Their comments and suggestions centered around the content, scheduling and quality of university based programs.

It is clear that science teachers want more and higher quality science content courses. Some would base pre-service training entirely in the science content area. Others commented that the content should meet the needs of their students rather than the needs of a university based research program. Other comments were directed toward a variety of content related courses that would focus on recent advances and current technology in science. Biology, environmental science, chemistry were mentioned at various sections throughout this report.

It is recommended that the science content of undergraduate teacher preparation programs be increased to reflect this concern and the standards established by the National Science Teachers Association. This recommendation (a minimum of 50 semester hours of balanced science credits) was implemented at UNLV shortly after this survey was taken. The science education program at UNR requires a major in a science content area and exceeds NSTA standards. It is further recommended that the State Department of Education revisit the standards for licensure in this area. Full licensure in single subject science areas is possible in the state of Nevada with 60 percent of the courses (30 credits) required for national standards.. The requirements for these licenses fall short of national (NSTA) standards with no concern for unified or balanced science content.

UNLV's teacher preparation program in secondary education is being revised to meet many of the comments, suggestions, and criticisms contained in this report. In short, the program requires the active participation of the teacher candidate in a structured program designed to meet the needs of Nevada's teachers. A strong field based component is maintained throughout the program. Case studies and scenario analysis have been implemented in order to introduce critical thinking and decision making into the methodology of teacher education.

It is recommended that Master's programs in Science Education with greater emphasis in the science content areas be established. The areas of chief interest as indicated by Nevada's science teachers were biology, chemistry, environmental science and physics or physical science. In agreement with national concerns, these programs should include a unified or balanced approach to science that stress the common themes of science. UNLV is in the process of establishing a Master's degree in the College of Science and Mathematics that is solely composed of science content courses. UNLV's College of Education has revised its existing Master's program in secondary education to include up to 18 hours of science content courses. A similar program in effect at UNR's College of Education requires from 15 to 21 hours of science content courses. It is important to note that the science content courses should meet the needs of secondary school teachers and their students. Mapping a program onto preexisting masters level courses designed for a different audience would not meet this need.

State Level Science Consultant

The results of this survey reveal many concerns of science teachers in Nevada. The survey strongly suggests that a science teacher support person at the state level would alleviate many of the concerns and problems facing Nevada's science teachers and help to implement some of the changes recommended in this report.

It is recommended that a science consultant position be established in the Department of Education. This position could provide direct support and assistance to science teachers throughout the state. Such a consultant should provide professional development experiences in some of these problem areas (e. g. how to motivate students in the laboratory who do not participate or who are disruptive; how the development of new technology can improve the teaching of science). A science consultant could also work with both administrators and science teachers on the issues of dealing with disruptive students, teacher autonomy, and some alternatives to reliance on teachers for non-teaching duties. A science consultant could also represent the interests of science teachers to the legislature in terms of the need for more adequate funding for science equipment and materials and funding for reduced class sizes in science laboratories.

## Epilogue

Nevada's science teachers are a dedicated group of professional educators who choose to provide a service to our state, have a deep interest in science, and toil with the youth of our state. An exceptionally large number of them have won awards, received recognition, actively participate in professional societies, seek to improve their profession, sit on educational committees, and engage in extracurricular activities. They do all this with little reward and hard work.

Nevada is the only state that does not have a science contact person at the State Department of Education level. Our teachers deserve a consultant. They deserve adequate and safe labs and classrooms with up-to-date equipment and materials. They deserve class sizes that encourage hands-on learning and the teaching of the processes of science. They deserve students who are motivated and willing to learn. They deserve the autonomy and academic freedom to implement the methodology of science and to explore in depth the grand conceptual schemes of science. They deserve the time needed to plan, organize, and execute those teaching techniques. They deserve to succeed. They deserve the best–the best that Nevada has to offer.

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## Notes and Acknowledgements

This survey could not have been possible without the efforts of Nevada's science teachers. The high response rate bears witness to their dedication to their students, science education, and the improvement of education in the State of Nevada. Special thanks to Joyce Dalbey for producing and processing the questionnaires. Special recognition to Dr. Phil Riner for his assistance in the statistical analysis.

# Appendix

(1-3)

Science Teacher Survey

General Instructions: We appreciate your taking the time to complete this survey. Most of the questions may be answered by placing an "X" in the appropriate box, next to the one best answer. Other types of responses (such as multiple or written) will be clearly indicated. The numbers in parentheses are for office use only.

## I. CURRENT TEACHING SITUATION

**1. In what type of school do you presently teach?**

(4)

1 [] middle school

2 [] junior high school

3 [] senior high school

4 [] K-8

5 [] combined junior/senior high school

6 [] sixth grade center

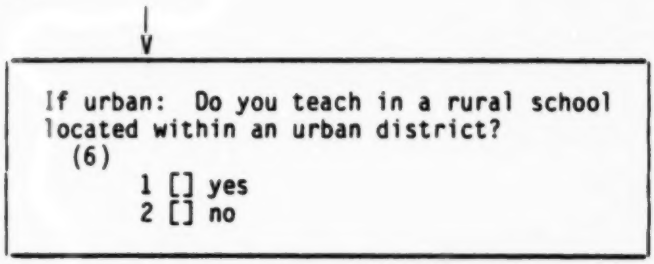
7 [] other; please specify _____

**2. Do you teach in a rural or urban school district (only Clark and Washoe counties are classified as urban)?**

(5)

1 [] rural

2 [] urban ----




**3. How would you describe the socio-economic background of most of the students in your school?**

(7)

1 [] generally low

2 [] generally middle

3 [] generally high

4 [] a mix of different socio-economic levels

5 [] don't know, not sure

4. **Please write in the following information about each class that you teach (whether a science class or other).**

(8-37)

| | Name of Subject | Current Size of Class | Ability Group Level (e.g. Special, Remedial, Basic, Average, Mixed, Advanced, Honor, AP) |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |

5. **How would you rate the adequacy of the following aspects of your current teaching situation? (Please circle the appropriate number).**

(38-54)

1 = Very adequate
2 = Adequate
3 = Somewhat inadequate
4 = Very inadequate

| | | Degree of Adequacy | | | | Comments (Optional) |
|---|---|---|---|---|---|---|
| 1. | Classroom facilities | 1 | 2 | 3 | 4 | |
| 2. | Laboratory facilities | 1 | 2 | 3 | 4 | |
| 3. | Library facilities | 1 | 2 | 3 | 4 | |
| 4. | Audio-visual equipment | 1 | 2 | 3 | 4 | |
| 5. | Audio-visual materials (films, tapes, etc). | 1 | 2 | 3 | 4 | |
| 6. | Storage space | 1 | 2 | 3 | 4 | |
| 7. | Funds for science materials | 1 | 2 | 3 | 4 | |
| 8. | Funds for science equipment | 1 | 2 | 3 | 4 | |
| 9. | Administrative support for science | 1 | 2 | 3 | 4 | |
| 10. | Teacher access to computers | 1 | 2 | 3 | 4 | |
| 11. | Student access to computers | 1 | 2 | 3 | 4 | |
| 12. | Appropriate computer software | 1 | 2 | 3 | 4 | |
| 13. | Science textbooks for students | 1 | 2 | 3 | 4 | |
| 14. | Science course of study | 1 | 2 | 3 | 4 | |
| 15. | Opportunities to keep up-to-date on current science information | 1 | 2 | 3 | 4 | |

| | | | | | |
|---|---|---|---|---|---|
| 16. | Opportunities to keep up-to-date on current teaching methods | 1 | 2 | 3 | 4 |
| 17. | Other (Please describe) | 1 | 2 | 3 | 4 |

_____

_____

## II. EDUCATIONAL BACKGROUND

**1. In what year did you complete your original undergraduate preparation?**
(55-56)

_____

**2. Where did you complete your undergraduate preparation?**
(57)

1 [] UNR

2 [] UNLV

3 [] Other ----

If other, please specify school and state.

_____, _____

**3. During your undergraduate program, did you complete a major or minor (or their equivalents) in one of the science areas? Mark only one.**
(58)

1 [] yes, a major (or its equivalent) in a science area

2 [] yes, a minor (or its equivalent) in a science area

3 [] yes, both a major and a minor

4 [] yes, a double major in science areas

5 [] no, neither a major nor a minor

**4. Did you earn undergraduate hours in education?**
(59)

1 [] yes ------

2 [] no

If yes, how many semester hours in education did you complete?
(60)

1 [] 12 or fewer
2 [] 13 to 24
3 [] more than 24

5. **Did you teach one or more science classes as part of your supervised student teaching?**

(61)

1 [] yes

2 [] no

6. **Have you completed any graduate level coursework in science?**

(62)

1 [] yes ------

2 [] no |

v

If yes, what areas of science did you study and approximately how many semester hours did you earn?

| Science Areas | Hours Earned |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

7. **From the following list of science areas, check <u>each area</u> in which you have completed at least 6 semester hours (either undergraduate or graduate).**

(63-71)

1 [] Biology

2 [] Chemistry

3 [] Biochemistry

4 [] Physics

5 [] Earth Science

6 [] Astronomy

7 [] Environmental Science

8 [] Calculus Level Mathematics

9. [] Other, please specify _____

8. **What degrees do you presently hold? <u>Check all that apply</u>.**

(72-76)

| Degree | Major or Area of Concentration | Minor |
|---|---|---|
| 1 [] bachelor's degree | _____ | _____ |
| 2 [] PDDSE degree | _____ | |
| 3 [] master's degree | _____ | |
| 4 [] specialist's degree | _____ | |
| 5 [] doctoral degree | _____ | |

**9. What degrees with what areas of concentration do you plan to complete in the future?**

(77-80)

| Degree | Area of Concentration |
|---|---|
| 1 [] master's | _____ |
| 2 [] specialist's | _____ |
| 3 [] doctoral | _____ |
| 4 [] none | |

**10. Which of the following responses best describes your preparation for your first teaching license/certificate?**

(81)

1 [] completed an undergraduate program in a college or school of education with teacher certification.

2 [] completed an undergraduate program in an area other than education with teacher certification.

3 [] completed most or all of the coursework required for certification <u>after</u> I completed my bachelor's degree.

4 [] Other, please specify _____

**11. How would you describe the <u>quality</u> of the teacher preparation program you completed?**

(82)

1 [] excellent; prepared me well for my first teaching assignment.

2 [] good; for the most part I was ready to begin my first teaching assignment.

3 [] adequate; I received the essentials.

4 [] mediocre; left too much to be learned on the job.

5 [] poor; almost a total waste of time.

**Comments (optional)**

_____

_____

_____

_____

_____

12. **More specifically, please evaluate the amount and quality of your undergraduate teacher preparation program in the following areas. Consider how each area contributed to your success in teaching. (Please circle the appropriate number under Amount and the appropriate number under Quality.)**

(83-138)

Amount of Preparation
1 = no preparation
2 = too little
3 = about right
4 = too much

Quality of Preparation
1 = no preparation
2 = poor
3 = satisfactory
4 = excellent

| | | Amount | Quality |
|---|---|---|---|
| 1. | Depth of knowledge in science subject matter | 1 2 3 4 | 1 2 3 4 |
| 2. | General liberal arts education | 1 2 3 4 | 1 2 3 4 |
| 3. | Psychology of teaching and learning | 1 2 3 4 | 1 2 3 4 |
| 4. | Human growth and development | 1 2 3 4 | 1 2 3 4 |
| 5. | Teaching strategies | 1 2 3 4 | 1 2 3 4 |
| 6. | Classroom management | 1 2 3 4 | 1 2 3 4 |
| 7. | Classroom discipline | 1 2 3 4 | 1 2 3 4 |
| 8. | History and philosophy of education | 1 2 3 4 | 1 2 3 4 |
| 9. | Audio-visual use | 1 2 3 4 | 1 2 3 4 |
| 10. | Science laboratory use | 1 2 3 4 | 1 2 3 4 |
| 11. | Safety in the science laboratory | 1 2 3 4 | 1 2 3 4 |
| 12. | Methods of problem-solving/critical thinking skills for students | 1 2 3 4 | 1 2 3 4 |
| 13. | Computer use in the sciences | 1 2 3 4 | 1 2 3 4 |
| 14. | Techniques for helping students develop effective study habits | 1 2 3 4 | 1 2 3 4 |
| 15. | Comparative learning techniques | 1 2 3 4 | 1 2 3 4 |
| 16. | Knowledge in physics | 1 2 3 4 | 1 2 3 4 |
| 17. | Knowledge in chemistry | 1 2 3 4 | 1 2 3 4 |
| 18. | Knowledge in biology | 1 2 3 4 | 1 2 3 4 |
| 19. | Knowledge in earth science | 1 2 3 4 | 1 2 3 4 |
| 20. | Knowledge in mathematics | 1 2 3 4 | 1 2 3 4 |
| 21. | Techniques for teaching science through discovery/inquiry | 1 2 3 4 | 1 2 3 4 |
| 22. | Techniques for developing better science reasoning skills | 1 2 3 4 | 1 2 3 4 |
| 23. | The use of supplementary curricula (Project WILD, OBIS, etc.) to enhance science instruction | 1 2 3 4 | 1 2 3 4 |

| | Amount of Preparation<br>1 = no preparation<br>2 = too little<br>3 = about right<br>4 = too much | Quality of Preparation<br>1 = no preparation<br>2 = poor<br>3 = satisfactory<br>4 = excellent |
|---|---|---|
| 24. | Science, technology, and societal issues and relationships | 1 2 3 4 — 1 2 3 4 |
| 25. | Environmental science content and processes | 1 2 3 4 — 1 2 3 4 |
| 26. | Motivating students to learn | 1 2 3 4 — 1 2 3 4 |
| 27. | Simple demonstrations of scientific principles | 1 2 3 4 — 1 2 3 4 |
| 28. | Techniques for effectively dispelling student misconceptions about science | 1 2 3 4 — 1 2 3 4 |

## III. CERTIFICATION STATUS

1. **Which of the following Nevada licenses/certificates do you presently hold? Check all that apply.**

(139-142)

1 [] provisional

2 [] elementary

3 [] secondary

4 [] special*

***NOTE:** "Special" includes administrative, counselor, library specialist, librarian, school nurse, school psychologist, social worker, staff specialist, and teachers of art, music, driver education, environment, foreign language, English as a second language, industrial arts, physical education, reading, and computer programming in grades K-12.

2. **Which of the following endorsements on your license/certificate do you presently hold? Check all that apply.**

(143-154)

Comprehensive Majors

1 [] Biological Science

2 [] General Science

3 [] Physical Science

Special

4 [] Environmental Education

Single Subject Majors

5 [] Biology

6 [] Botany

7 [] Chemistry

8 [] Earth science

9 [] Geology

10 [] Physics

11 [] Physiology

12 [] Zoology

3. **Do you hold any other endorsements in the State of Nevada?**

(155)

1 [] yes ------

2 [] no |

V

If yes, please list them.

_____

_____

_____

4. **Have you ever been licensed/certified to teach in another state or country?**

(156)

1 [] yes ------

2 [] no |

V

If yes, please name the other state(s)/countries.

_____

_____

5. **Have any of the licensing/certification or recertification regulations in the State of Nevada been troublesome for you to meet?**

(157)

1 [] yes ------

2 [] no |

V

If yes, please explain.

_____

_____

_____

## IV. PROFESSIONAL CAREER ACTIVITIES

1. **How many full-time years of 7-12 teaching will you have completed at the end of this academic year?**
**(Include all experience, both in Nevada and elsewhere)**

(158)

1 [] one
2 [] 2-4
3 [] 5-7
4 [] 8-10
5 [] 11-13
6 [] 14-16
7 [] 17-19
8 [] 20 or more

2. **During the last five years, what kinds of credit have you completed for professional development? Check all that apply.**

(159-166)

1 [] in-service coursework
2 [] continuing education
3 [] correspondence study
4 [] university coursework in education
5 [] university coursework in science areas
6 [] community college coursework
7 [] none
8 [] other; describe _____

(167) **PLEASE UNDERLINE THE OPTION ABOVE IN WHICH YOU HAVE TAKEN THE MOST CREDITS**

3. **Check all the following professional activities in which you have been involved at any time during your teaching career.**

(168-176)

1 [] membership in a national science teachers association
2 [] membership in a local, state, or regional science teachers association
3 [] elected officer in a science teachers association
4 [] member of a science curriculum development/evaluation committee
5 [] member of a science textbook selection/evaluation committee
6 [] instructor for school district in-service course
7 [] master teacher or cooperating teacher for one or more student teachers
8 [] department chairperson
9 [] other, please specify _____

4. **What were your main considerations in choosing teaching as a career? Please number only those that apply to you in order of importance.**
(177-190)
**(1 = most important, 2 = next most important, etc.)**

___ Interest in science
___ Opportunity to provide an important service
___ Family tradition
___ Inspired by a favorite teacher
___ Desire to change careers
___ Desire to work with young people
___ Flexibility well suited to changing family demands
___ Non-demanding preparation program
___ Interest in transmitting scientific knowledge/methods
___ A good temporary career
___ Summers off
___ Early retirement
___ Job security
___ Other (please specify _____

5. **How would you describe yourself professionally?**
(191)

1 [] a science teacher
2 [] primarily a science teacher although I may teach some other classes from time to time
3 [] primarily a(n) _____ teacher who also teaches some science classes
4 [] both a science and a _____ teacher
5 [] Other (please specify) _____

_____

6. **Have you ever received any awards or types of recognition related to your teaching?**
(192)

1 [] yes --
2 [] no

If yes, please describe.

## V. PERSONAL INFORMATION

**Please check those that apply to you.**

(193) **1.** [] male
[] female

(194) **2.** 1 [] Caucasian
2 [] Black
3 [] Asian/Pacific Isles
4 [] Hispanic
5 [] Native American Indian
6 [] other, please specify _____

(195) **3.** 1 [] 20 - 25 years of age
2 [] 26 - 30
3 [] 31 - 35
4 [] 36 - 40
5 [] 41 - 45
6 [] 46 - 50
7 [] 51 - 55
8 [] 56 or older

## VI. OPINIONS AND SUGGESTIONS

**1. Do you recall any single course, professional development session, workshop or other learning experience which significantly contributed to improving the quality of your classroom teaching? If yes, please describe.**

(196)
1 [] yes --
2 [] no |
V

| If yes, please describe. |
|---|
| |
| |

2. Consider your most important needs for additional training/assistance/education (See question 12, page 6 for ideas). With these in mind, what would you suggest as the highest priorities for the content of the following:

**Professional Development Sessions**
1 _____
2 _____
3 _____

**Summer Workshops**
1 _____
2 _____
3 _____

**Master's Degree Program in Science Education** (proposed)
Please check program area preference(s)

- [] Chemistry
- [] Physics
- [] Biology
- [] Earth science

1 _____
2 _____
3 _____
4 _____
5 _____

**Revisions to Secondary Course of Study-Science**
1 _____
2 _____
3 _____
4 _____
5 _____

3. Most of us experience restrictions of one kind or another in our work situations which prevent us from doing the job as we would like. What changes would be necessary in your current work situation in order to make your job more ideal?

_____
_____
_____
_____

4. Any final comments (optional).

_____
_____
_____
_____

**THANK YOU VERY MUCH**